A stabilization system for a motor vehicle includes an independently actuable airbag assembly disposed at each wheel. A damper assembly disposed at each wheel is lockable to maintain the motor vehicle in the desired level position. The system includes a controller in communication with the airbag and damper assembly and a sensor assembly that senses a relative position of the body of the motor vehicle relative to a level plane and adjusts the airbag assembly in order to attain a level position of the motor vehicle and once that level position is attained, lock the damper assembly in order to provide a foundation-like feel to the motor home in a parked position.
SUSPENSION WITH INTEGRATED LEVELING AND STABILIZATION MECHANISMS

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to a leveling and stabilization system for a motor vehicle and specifically to a leveling and stabilization mechanism for a motor home or recreational vehicle.

[0002] Typically, a motor home or recreational vehicle is used off-road in rough areas or campgrounds that may not have a level surface. The non-level surface creates an uncomfortable feeling for occupants within the motor home especially if long durations of time are spent at a specific location. To correct for the uneven terrain that is often found at campsites, leveling aids such as jacks are often provided with the motor home.

[0003] Typically the motor home will include jacks or other manual leveling type devices disposed at each of the four corners of the motor home. The mechanical or manually operated leveling device can include any type known to those skilled in the art. Each jack is extended from a corner of the motor home until a satisfactorily level condition is obtained. Manually operated jacks are undesirable because of height limitations of the jacks that in some instances may not extend adequately to level the vehicle. Further, manually operated jacks are tedious and can be difficult to operate if not carefully maintained. Additionally, during inclement weather it maybe undesirable to leave the motor home in order to operate such manually operated jacks to level the vehicle.

[0004] Motor homes are typically equipped with a heavy-duty suspension to adequately provide for the desired ride considering the weight of the vehicle. Further, it is known in the art to use a pneumatic suspension system having pneumatically actuated dampers disposed at each wheel and controlled by a master control to raise and lower specific points of the motor home in order to properly level the motor home relative to the specific camping or parking space it is occupying. Such systems double as the vehicle suspension system during operation of the vehicle on the roadways. As appreciated, because the suspension system provides some give within the motor home, even though the motor home has been leveled, there can be a bouncy or spongy feeling experienced by occupants as they walk about the interior of the motor home. This bouncy or spongy feeling is due to the suspension of the motor home giving as is required during operation on roadways.

[0005] The same give and compliant nature of the suspension system desirable as the motor home is operated on a roadway provides undesirable sensations to an occupant when the motor home is parked in a campground or other position where the motor home is now operating as a temporary residence. As appreciated, occupants desire a steady and solid feel when parked and in use as a temporary residence.

[0006] Further, such suspension systems are complicated and require expensive and complex hydraulic mechanisms that add to the cost and complexity of an already expensive motor home. As appreciated, motor homes are often taken into rougher environments than are envisioned by vehicle designers. This combined with a complex hydraulic mechanism will often result in premature failure or reduce operational capacity of the hydraulic systems.

[0007] Accordingly, it is desirable to develop a leveling and stabilization system for a motor home that utilizes existing suspension components to level the motor vehicle and that can lock the motor vehicle in a level position to provide a stable condition when the motor home is used as a temporary residence.

SUMMARY OF THE INVENTION

[0008] The system of this invention is an integrated leveling and stabilization system that includes an independently actuated airbag assembly and lockable damper assemblies disposed at each corner of the motor vehicle to level and stabilize the motor vehicle.

[0009] The system of this invention includes an air suspension system having an independently actuated airbag disposed at each wheel of the motor home. Each air spring is independently actuated relative to other airbags disposed at the other corners of the motor home. In operation, the air bag is inflated or deflated in order to raise or lower a corner leveling the entire motor home and providing a comfortable stable position.

[0010] The system also includes a damper assembly disposed at each of the wheels of the motor home. The damper assembly of this system includes a valve that is actuable to adjust the damper between an on position and a locked position. In the locked position, the damper assembly becomes a locked or fixed member such that the body of a motor home does not move relative to the suspension or frame members of the motor home. As appreciated, locking the damper assemblies of the motor home will stabilize the motor home and vehicle to eliminate any movement that may occur in the body of the motor home relative to the frame and suspension such that occupants within the motor home will experience a stable and foundation like feel.

[0011] The system includes a controller in electrical communication with at least one sensor for detecting the position of the motor home relative to a level plane. The controller is also in communication with the damper assemblies and air spring assemblies. The controller will actuate the air spring assemblies once the vehicle is in a parked position and the system is engaged to level the motor vehicle relative to a level plane. Once a satisfactorily level condition of the motor home is obtained, the controller locks the damper assembly.

[0012] Accordingly, the system of this invention provides for a greatly enhanced, simple and stable leveling and stabilization system for a motor home. Further, leveling and stabilization mechanism of this invention prevents and inhibits roll and rocking of the motor vehicle once a desired position is obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows:

[0014] FIG. 1 is a schematic illustration of this system disposed within a motor home;
FIG. 2 is a schematic illustration of one corner of the motor home;

FIG. 3 is a schematic view of the entire system;

FIG. 4 is a plan view of an embodiment of a damper assembly; and

FIG. 5 is a plan view of an embodiment of an air spring assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, wherein like numerals indicate like or corresponding parts throughout the several views, the invention is a suspension and leveling stabilization system generally indicated at 10. The system 10 is installed within a motor home or recreational vehicle 12. Although this system is shown installed within a recreational vehicle or motor home 12, it is within the contemplation of this invention that the stabilization and leveling system of this invention may be applied to other motor vehicles that would benefit from a leveling mechanism that can stabilize the motor vehicle once the desired position is obtained.

The system 10 of this invention includes an airbag assembly 18 disposed at each wheel 24 of the motor home 12. By providing an air spring assembly 18 at each wheel 24 of the motor home 12, a leveling device is disposed essentially at each of the corners of the motor home. The air spring assembly 18 is as is known to a worker skilled in the art. In such systems, an air spring 18 is disposed at each wheel 24 of the motor home. The air spring 18 is typically maintained at a desired pressure that provides for a desired ride characteristics of the motor home 12 as it is operating on the roadways.

In the system 10 of this invention, each of the air springs 18 is independently actutable relative to air springs either on an opposite side of the motor home 12 or to the front or rear of the motor home. By providing independent actuation of each of the air springs 18, leveling of the motor home 12 is accomplished by adjusting pressure within the air springs 18 disposed at the four corners of the motor home 12.

The system 10 includes a controller 26 that is in communication with sensors 34 disposed about the motor home. The sensors 34 sense the position of the motor home 12 relative to a level plane 36. The controller 26 then operates a valve 40 disposed in each of the air springs 18 to independently actuate each of the air springs 18 to either pressurize or de-pressurize that air spring to level the motor home 12. The motor home 12 includes a rear axle 16 and a front axle 14. The air springs 18 are typically assembled to the axle assemblies 16, 14 to provide desired ride characteristics of the motor home 12 while being operated on a roadway.

Additionally, damper assemblies 20 are disposed at each wheel 24 of the motor home 12. The damper assembly 20 of this system includes a valve 30 actutable between an on position and a locked position. In the locked position, the damper assembly 20 becomes a fixed member and allows no relative movement between the body 38 and suspension of the motor vehicle 12. As appreciated, the damper assembly 20 may be of any type as is known by a worker skilled in the art, and although a damper assembly having an on position and a locked position, it is within the contemplation that the damper assembly may also provide variable dampening between the on position and locked position.

Referring to FIG. 2, a portion of the system 10 is shown including the airbag assembly 18 and damper assembly 20. The airbag assembly 18 and damper assembly 20 are assembled to the rear axle 16 that suspends the wheel 24. As appreciated, in operation of the motor vehicle 12 along a roadway, the air spring assembly 18 provides for a specific ride characteristic of the motor home 12 while the damper assembly 20 prevents oscillation of the body 38 of the motor home relative to the axles 16. Sensor 34 disposed in a position relative and associated with the air spring 18 and damper assembly 20 provides relative position of the motor home 12 relative to the level plane 36, as shown in FIG. 1.

Referring to FIG. 3, the system 10 is schematically shown disposed within a motor home 12. The system 10 includes an air supply 26 that supplies air to each of the air springs 18 by way of air supply lines 28. The air supply 26 provides sufficient air pressure to the air springs 18 in order to provide both the desired ride characteristics of the vehicle 12 and to raise and lower each corner of the motor vehicle 12 in order to reach a desired position. The valve assemblies 40 are shown disposed within the air spring 18. Although in this embodiment, the valve assembly 40 is disposed within the air spring 18, it is also within the contemplation of this invention that the valve assembly 40 for controlling pressure within an independent air spring may be disposed anywhere within the air system such as at the air supply 26 as is known to a worker skilled in the art in order to provide and direct and control specific air pressure within an individual air spring 18.

The valve 40 in communication with the controller 32. The controller 32 is also in communication with sensors 34 disposed about the motor home 12. In this embodiment, a sensor 34 is shown at each corner of the motor vehicle. It should be understood that it is within the contemplation of this invention that additional sensors 34 or less sensors may be utilized for providing position information of the motor home 12 relative to a desired level plane 36 (See FIG. 1).

Accompanying each air spring 18 is a damper assembly 20. The damper assembly 20 includes a valve assembly 30. The valve assembly 30 is actutable between an actuated position allowing for movement of the dampening member and a locked position which locks the dampening member. The valve assembly 30 is in communication with the controller 32. A damper assembly 20 may be of any type known to a worker skilled in the art and it is within the contemplation of this invention that the dampening assembly 20 may also include variable dampening means as are known to a worker skilled in this art.

In operation while traveling along a roadway, the air springs 18 and damper assemblies 20 operate as is typically understood. The air springs 18 provide a favorable and compliant suspension during operation of the motor home 12 along the roadway. Once the motor home 12 is parked, the controller 32 recognizes that the vehicle is in a parked position and senses the relative position of the motor home 12 relative to the level plane 36 (FIG. 1). The controller 32 may be manually or automatically actuated.
such that an operator may manually actuate the system to level the motor home 12 or set to automatically level and stabilize the motor home 12 once the motor home is parked. In either mode of operation the controller 32 will trigger the air spring control valves 40 and each of the independently actuatable air springs 18 to either raise or lower the specific portion of the motor home 12 to reach the level plane 36. Sensors 34 disposed about the vehicle will read the specific position of a portion of the motor home 12 relative to the level plane which in turn is transferred by the controller 32 into commands for pressurizing or de-pressurizing individual air springs 18.

[0029] Once the motor home 12 has obtained a level position by pressurizing or de-pressurizing individual air springs 18, the motor home body 38 will provide a compliant or bouncy feel to occupants moving within the passenger compartment of the motor home 12. This is so because the air springs 18 are compliant in order to provide the desired ride when the motor home 12 is moving along the roadway. The damper assemblies 20 are actuated to lock the body 38 of the motor home 12 to prevent relative movement between the suspension system and frame 22 of the motor vehicle 12.

[0030] Preferably, the damper assembly 20 operates by allowing fluid flow through a specifically sized orifice. The specifically sized orifice provides the dampening characteristics that eliminate oscillation of the motor home 12 caused by inconsistencies of the roadway. Once this orifice is blocked and fluid is not able to flow from one chamber to another, the dampening assembly 20 becomes essentially a fixed member that prevents movement of the body 38 relative to the wheels 24 to provide a foundation like feel to the motor home 12.

[0031] The foregoing description is exemplary and not just a material specification. The invention has been described in an illustrative manner, and should be understood that the terminology used is intended to be in the nature of words of description rather than of limitation. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, one of ordinary skill in the art would recognize that certain modifications are within the scope of this invention. It is understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. For that reason the following claims should be studied to determine the true scope and content of this invention.

What is claimed is:
1. A stabilization system for a motor vehicle comprising:
   an airbag assembly disposed at each wheel and independently actuatble for adjusting a corner of the motor vehicle to a desired position;
   a damper assembly disposed at each wheel and lockable for maintaining said motor vehicle in said desired position;
   a controller in communication with each of said airbag and said damper assembly for actuating said airbag assembly and said damper assembly to stabilize said motor vehicle in said desired position.
2. The system of claim 1, further including a sensor assembly for determining a relative position of said motor vehicle to a level plane.
3. The system of claim 2, further including a sensor assembly at each corner of said motor vehicle.
4. The system of claim 1, wherein said controller is actuable to adjust said airbag assemblies to said desired position.
5. The system of claim 1, wherein said damper assembly includes a valve assembly actuable between a locked and unlocked position.
6. The system of claim 1, wherein said motor vehicle is a motor home.
7. The system of claim 1, including an air supply and a valve associated with each of said airbag assemblies for controlling air within said airbag assembly.
8. The system of claim 1, wherein said controller locks said damper assembly only when said motor vehicle is parked.
9. The system of claim 1, wherein said controller automatically senses a position of said vehicle and actuates one or more of said airbag assemblies to level said motor vehicle.
10. The system of claim 9, wherein said controller moves said damper assemblies to a locked position once said motor vehicle is leveled.
11. A method of stabilizing a parked motor vehicle comprising the steps of
   a. sensing a position of said motor vehicle with at least one sensor relative to a level plane,
   b. actuating one or more airbag assemblies to move said motor vehicle toward said level plane; and
   c. locking damper assemblies disposed at each wheel of said motor vehicle, preventing movement of said motor vehicle from said level plane.
12. The method of claim 11, wherein said airbag assemblies are disposed at each wheel of the motor vehicle and said step a. is further defined by independently actuating each of said air bag assemblies to level said vehicle.
13. The method of claim 11, further including a sensor disposed at each corner of the motor vehicle to sense a position of said motor vehicle relative to said level plane.
14. The method of claim 11, further including the step of automatically leveling said vehicle in response to parking said motor vehicle.
15. The method of claim 11, further including the step of automatically unlocking said damper assemblies in response to said vehicle being moved from said parked position.